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**APPROPRIATE TECHNOLOGY
FOR LIGHT ENGINEERING INDUSTRIES
AND RURAL WORKSHOPS**

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APPROPRIATE TECHNOLOGY FOR RURAL INDUSTRIES
Background Paper

APPROPRIATE TECHNOLOGY FOR RURAL INDUSTRIES

by

A. D. Adhikari
UNIDO consultant

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LIST OF CONTENTS.

<u>Chapter No.</u>	<u>subject</u>	<u>Page</u>
I	Introduction	1- 15
II	Analysis of rural needs	16- 20
III	existing experience in respect of rural production units.	21 - 28
IV	Grouping of products	29
V	Assessment of plant size and investment requirements.	30 - 58
VI	Adoption and diffusion of appropriate technology.	59 - 63
VII	Linkages between urban and rural sectors.	64 - 66
VIII	Policy incentives and concessions.	67 - 71
IX	Guide-lines for strategy development.	72 - 73
X	Summary and conclusions.	74 - 78

I. INTRODUCTION:

1. Appropriate Technology.

1.1. Through centuries, manual work has been gradually substituted by mechanical and electrical assistance to produce goods at a lesser cost with better quality. As a result of this, the products of sophisticated technologies have now dominated the market replacing the products of traditional technology. The multinational Corporations with their aggressive marketing techniques and expensive research and development programmes are now in a position practically to dictate the terms to the consumers of their products. Because of this background, the developed countries have a tremendous lead over the developing countries, many of which were once colonies of some of the developed nations. Most of the developing countries are at the receiving end of the technology being at the bottom of the scale although a number of developing nations have technologies which can well compare with those of the developed nations.

1.2. There is no doubt that the standard of living of the poorer countries has to be improved and the gap between the rich and the poor is to be reduced quickly. As such, many of the products now made by developed nations shall have to be made by the developing nations in near future and to do so, the technology shall have to be transferred to the developing nations at the appropriate level as it is not necessary now to go through the expensive and time consuming process of developing these technologies again by the developing nations. In spite of some developing countries having developed technologies due to the availability of adequate talents and experience in their own country, technology transfer shall have to be there at a faster and faster rate to reduce the gap between the rich and poor nations.

1.3. In transferring the technology one has to avoid the misunderstanding of psychological barrier between the 'giver' and the 'taker'. The 'giver' as a developed nation, should consider it to be its responsibility to improve the lot of the poor nations. The 'taker' has to have the grip on the technique

from the very beginning and must see that it is not going to be dependent on the 'giver' for ever. Otherwise a neo-economic-colonisation psychosis may occur.

2. Agricultural background of rural area.

2.1. The rural civilisation in most of the developing countries began with the agricultural settlement as it has been giving dependable livelihood in situ for the last so many centuries. With the industrial revolution in Europe a transition from agriculture to industry took place from 'have not past' to 'have present' and millions of unemployed and poor rural workers moved from agriculture into the various industrial centres. As the industries needed infrastructure facilities like good transport, market and entrepreneurship and as most of these facilities were available in big trading centres, naturally those centres developed gradually into the gigantic industrial urban cities of today. The adaptation to changing conditions is essential not only for improving one's lot but even for survival. Those rural people, who lacked mobility due to their

attachment to social, religious and ethnic groups, remained 'stay put' and poor. As if to make up for the lost opportunities, even today, there is mass migration of agricultural workers from the Mediterranean countries of Europe and from Asia to the countries of industrial towns in Europe and North America. One can see thousands of people with an agricultural background from Portugal, Spain, Turkey and from many other Asian countries looking for jobs in France, Finland, ^{the Federal Republic of} Germany, Sweden, the U.S.A., Canada, the U.K. and Australia and, of late, in oil-rich countries in Western Asia. To reduce the ratio of agricultural employment to industrial employment from 70:30 to 30:70, a vast population employed in agriculture is becoming unhappy with the state of poverty and it is making them now quite mobile to seek employment either in industrial nations or in urban areas of particular developing countries. As the migration of such huge populations is neither desirable nor possible, we have to find out how to create employment in situ instead of mass migration to urban areas or to the industrial nations.

2.2. Entrepreneurship.

Apart from lack of infrastructure facilities and market, entrepreneurship is practically non-existent in rural areas. Of late there is some tendency of many professional scientific and technical people in the industrial nations in Europe and America to becoming mobile and adventurous. These professionals somehow cannot be contained in their own jobs in the surroundings they are used to. They are looking for a new environment and new entrepreneurship. They are not exactly the entrepreneurs of the traditional type but are professionals determined to succeed and seems to be fearless of the change that may challenge their ability and knowledge. As the entrepreneurs of the old type have now settled in the developed countries or in the urban areas of the developing countries, there is a possibility that these new types of entrepreneurs can act as catalytic agents in starting rural industries to provide employment to the agricultural people in the rural area itself converting them gradually to industrial employment to start a chain reaction of creating small workshops, which will be quickly converted into mechanised ones and then to the organised industrial units till we have a

number of industrial towns in the rural areas all over the developing nations with a view to reverse the ratio of employment in agriculture to industry from 70:30 to 30:70. The initiative in this regard shall have to come from the international organisations if we want to get results quickly and the financing of the expenses of these new entrepreneurs-cum-managers shall have to be borne by the developed countries if the developed countries are keen to reduce the gap between the developing nations and the developed nations.

3. Advantage and disadvantage of rural industries compared to urban industries.

3.1. When we talk about rural industry, we assume that the particular industry is already existing in that country and is feasible in an urban area. The same technology that is feasible in a rural area will have to have some advantages over the same technology in an urban area because of limited markets and the extra cost of transport of goods and services between urban and rural areas. A manager in a rural industry will have to be more efficient, adaptable

and versatile to make a rural industry with appropriate technology successful, and therefore, he is bound to be more expensive than a manager in an urban area. The advantage of setting up of a rural industry is the abundant availability of labour, who are under-employed or unemployed. Another point of advantage may be the proximity to natural resources, whether they be of agricultural, mineral or forest origin.

4. Traditional Rural Industry - Human resources and training.

4.1. The rural areas in most developing countries, having inadequate transport facilities, have a village economy with a limited market. The village economy sustains itself by having its own traditional artisans and tradesmen. Many people thought and even now think that tradition in skill is very essential. Today there is hardly any industry in which the traditional technology of artisans is required. All workers, even without any industrial or technological background, can be trained within a reasonable space of time to produce products of sophisticated technology. Examples are cited below.

- 4.2. When the U.S.A. was starting to manufacture the motor car, Europeans thought that they would get nowhere as the U.S.A. did not have master craftsmen who could make the various parts required for an automobile. They thought that craftsmanship, which has been acquired by Europeans through the centuries can only be successful in manufacturing motor cars. The assumptions proved wrong when Mr. Henry Ford developed a method which is now very well-known as the "assembly line". This new method did not need traditional craftsmen. With this method, the lead which was taken in the manufacturing technology of the motor car by the U.S.A nearly six decades ago is still being maintained.
- 4.3. The other recent example is that of Matsusitas in Japan. One of the Matsusitas factories manufacturing products with sophisticated technology, marketed under the brand name of "National", proudly told the writer when he visited the factory in 1965 that the average age of their workers was below 25.

4.4. The third example on this is from Thailand. When the writer visited a jute factory around 1966, which was run very efficiently, he found it unusually clean and the workers very diligent. On enquiry it was learnt that the management of the jute mill, when the mill was first set up in this rural area using imported skilled workers had problems both from the local workers as well as from the imported ones. The management then decided to send back most of the imported workers and undertook an intensive training programme of the rural workers with agricultural background. In spite of the pre-planned training programme, most of the workers had a tendency during the harvesting season to help their parents thus increasing absenteeism in the factory. The manager went from house to house to explain to the workers and parents the favourable factors of providing employment to a young man in the family, who would get an income throughout the year and how it would be more economic for the household to hire another person, during the harvesting period, who was always available in a developing economy with so many unemployed in the rural areas. After persistent visits and the coercion of the

dedicated manager, the following year, the number of workers leaving the factory during harvesting season decreased and the jute mill was running with a very high percentage of local workers as efficiently as any jute mill thereafter.

4.5. In Japan, when a particular person with a rural background became a top executive in an engineering firm in a big city, he thought of the lower standard of living of the villagers where he was born. He introduced a scheme where machine tools were installed by the firm. The huts were extended at the cost of the firm to accommodate the machines. An inspector was posted at the village to inspect the products and to give technical services. The workers were trained to read drawings and make the parts, which were not very complicated. Because of the missionary initiative and efforts of this particular manager, he not only could create employment in the rural area where he came from, but he also ensured a definite source of ancilliary items for his firm. What he did was to introduce appropriate technology so that

a particular type of machine tool became easy to handle to make a few items, which was required in bigger quantities by a large industry. The additional transport cost either way, including the cost of inspection and services, was more than made up by the lower wages and lower overheads in the rural area. The villagers were quite happy staying in their own surroundings without having to cut off suddenly from their rural surroundings to take to city life in search of jobs and, many a time, into uncertainty.

4.6. These four examples bring out the fact that it is not necessary to depend on the old craftsmen requiring experience and skill. Today through schools and institutional training one can convert a raw unemployed villager to a useable worker in an industry within a short period. Therefore, in the transfer of technology - especially of the appropriate one, the training in the technology will have to precede the starting of production. In fact, many a time it has been seen that the discipline and the quality of work are much better when a new

technology at the appropriate level is done through intensive training rather than taking so-called experienced and skilled workers. For acquiring such training, the criteria of nationality should be relaxed. If cost of such training is beyond the capacity of the country, then an international organisation should come forward to provide the assistance.

4.7. Thus, as long as there is availability of under employed and unemployed persons in rural areas, the degree of adaptability of an appropriate technology should not be a deterrant as this can be made up by a pre-planned training programme.

4.8. As the product of the rural industries, produced through appropriate technology, will have to be sold in markets in competition with goods manufactured in urban areas or in other countries having a better technology, low production costs are essential. It should be borne in mind that nobody in the rural area even near the factory will buy the product of the rural industry because it is made near

their village. In fact sometimes there is a reverse affect as the consumers' reaction is more favourable towards well-known brands made in a city or by advanced technology.

For example - the writer was told once that in the U.K. some years ago, the farmers of Isle of Man had to sell their cheese by using a well-known brand name, well-established in market, as the consumers rejected the cheese sold under some local name as "Manx Cheese."

As such, the sensitivity and availability of domestic markets will have to be always kept in mind when deciding the appropriate technology for a rural area. The natural corollary of this is to have a very small size unit. If this is a deduction, then we are in another troubled area. The village industries were already there to serve the village economy. In the old days every group of villages was served by a few blacksmiths, goldsmiths, potters, carpenters, etc. All these artisans and craftsmen are now reducing in number as better-quality goods, made at cheaper cost by improved technology, came into the market. First gave way to the lower technology village industry

products of small workshops and then to those of bigger workshops and then to the products made thousands of miles away in organised industry through sophisticated technology. In my opinion, it is futile to try to keep such lower technology village industry going on when it becomes expensive though there is a school of thought exactly opposite to this.

5. Rural Resources.

5.1. Surplus rural resources, whether they be in agricultural, mineral or forest, should be processed with an appropriate technology before they leave the rural area. A rural industry has a better chance of survival if it is established near the rural resources compared to the rural site where the resources are not available.

6. Supply of low technology products to developed countries.

6.1. Due to the steep rise in standard of living of the industrial Nations, there is a variety of products which can be made in the developing countries, as these products do not need high technology and sophisticated equipment.

Of late, ready-made garments are being supplied to Europe and the U.S.A. to a great extent from the developing countries.

There is possibility of further increasing the trade in ready-made garments between developing and developed countries. There are many handicrafts and traditional artisans in the developing countries, who are living below the poverty line. These artisans can manufacture goods for the requirements of industrial societies provided the big department stores agree to give design and take steps to procure these items from the groups of rural workers. These items may include products of handloom and handicraft, jewellery items, cane, bamboo and wooden furniture and the like. The demand for most of the items can be increased tremendously in the industrial nations to give sufficient scope to creating employment in developing nations if a deliberate and definite policy is taken by the developed nations to help the rural artisans of the developing nations.

II. ANALYSIS OF RURAL NEEDS.

An analysis of the data pertaining to income and expenditure of marginal farmers and agricultural labourers in India reveals that their average monthly expenditure exceeds their income. The outcome is the increasing incidence of indebtedness among rural people. Because of low income, the majority of marginal farmers and agricultural labourers are found to live below the poverty line, defined in terms of the minimum desirable per capita consumer expenditure. As a result, the purchasing power in the rural areas is extremely low as more than 50 per cent of the agriculturists live below the poverty line. Due to low purchasing power, village needs are limited.

This situation has arisen mainly due to having too many persons in the rural economy i.e., in agriculture, therefore, the production in the primary sector i.e., agriculture, mineral and forest will have to be boosted. This increase in production will start a chain reaction of conversion of agricultural employment to industrial employment. As such, while analysing rural needs with a view to improve the rural economy by creating an agricultural surplus, one necessarily needs to first give attention to the inputs for

increase in agricultural production. Surplus from the primary production sector will give more purchasing power to rural people and will thus not only create more demand for consumer goods but will also justify the establishment of viable processing units in rural areas. These are analysed itemwise below:

2.1. Agricultural inputs.

2.1.1. Implements such as tractors/power tillers/improved ploughs, pumps for irrigation purposes driven by rural power or by diesel engine sets:

In an area/developing country where per capita income is less than \$ 150, conventional ox ploughing is still practised. There is an urgent need to introduce mechanized ploughing in these areas. This can be done in a phased manner. In an area of higher per capita income, however, mechanized ploughing, harvesting, irrigation by pump driven by electric/diesel engine set is quite common. The afore-mentioned industries being by their very nature capital intensive and requiring skilled manpower are mostly located in urban or suburban areas.

This equipment, however, requires periodic mechanical maintenance, services for which are not available in rural areas. People, therefore, have to go to distant places. This is a time-consuming and costly process and is, in fact, one of the

reasons for discouraging the rural agriculturist from adopting mechanized means. The mobile workshop for this purpose, will be a nucleus for rural industrialization in the course of time. With the rising standard of living, the mobile workshop may not be in a position to cater to the needs of various sectors and it will then be necessary to have a bigger size service workshop for repairing pumps, automobiles, tractors, various machinery, electrical motors.

2.1.2. Chemicals such as fertilizers, insecticides:

These are required for improving the yield of agricultural products per acre of land. Naturally, the chemicals are to be available at a cheap price. This will be possible mostly from low cost, high-volume technology.

2.1.3. Power:

Cheap rural power should be available on a sustained basis.

2.1.4. Water:

A plentiful supply of water should be readily available.

2.2. Consumption goods:

2.2.1. Processed cereal:

Huge amounts of cereals, produced on

the agricultural fields, are to be processed for production of finished cereals for e.g. rice from paddy, flour from wheat, edible oil from oil-bearing seeds.

2.2.2. Clothing and readymade garments:

The requirements for these in rural areas are quite high. Besides meeting rural requirements this industry can cater to the needs of urban people or other developing or developed countries. If big department stores in urban areas/developing countries/developed countries can find some items, which can be made with the traditional skill of developing countries, there could be a high potential for creating employment in rural areas.

2.2.3. Non-edible oil and soap:

The non-edible oil and soap industry serves three purposes viz. it produces useful commodities from natural resources which generally remain unutilised and hence wasted; it augments the supply of edible oils and fats for human consumption, as non-edible oils can be used as a good substitute for edible oil in soap manufacture; and non-edible oil resources can offer supplementary employment in the areas where material is available.

2.2.4. Building materials:

The typical building materials used in rural sectors are - wooden beams, wooden slabs, hardware. A lumber mill located in a rural area can cater to the requirement of urban areas or even requirements of other developing or developed countries in addition to fulfilling its own requirements. Similarly a service workshop located in a rural area can easily fabricate hardware for the rural people.

2.2.5. Animal fodder:

Huge amounts of waste from rice mills, cereal grinding mills, oil extraction screw presses could be mixed with maize and mineral salts, enriched with proper vitamins and used as animal fodder. Requirements are high for rural areas and urban areas as well.

2.2.6. Bricks and Tiles:

Most of the requirement is for the urban and semi-urban areas. These industries are mostly located in the areas where particular type of soils required for brick manufacturing are found. After working the area, the land becomes completely barren. These industries have a locational advantage in semi-urban areas.

2.2.7. Furniture

The requirement is for both rural and urban areas as well. This can be coupled with a lumber mill to ensure better utilisation of scrap produced in the process.

2.3. Utilisation of surplus resources and traditional skills:

2.3.1. Mini pulp/paper plants:

Quite a huge amount of agricultural residues, like rice straw, wheat straw, jute stick and cellulosic raw materials, are either decaying insitu or being utilised inefficiently. A mini-pulp and paper unit can be set up in rural areas to utilize these surplus residues. The product can be completely consumed in the area or may be sent for urban consumption. In a paper entitled " Strategies for development of pulp and paper industries in developing countries " presented at this International Forum the author has highlighted the various issues for the development of a mini-pulp and paper unit from agricultural residues.

2.3.2. Handicraft and traditional products:

In every country there are traditional handicraft and handloom workers. They are dwindling in number because of lack of markets in their own locality. In developed countries, especially in

highly industrialized nations, a new market for these products has developed. If the design, market and the technique of manufacturing of these products with traditional skill can be developed in a much bigger volume, an avenue of big employment potentiality will be created for rural people as most of these traditional skilled people are located in rural or semi-urban areas. In fact, this has happened to a great extent in India in the handicraft products export trade over the last twenty years. The table below will give an idea of the volume of business involved in the export of readymade garments, coir products and handicrafts in India:

Table: Export of readymade garments, coir products and handicrafts:

	Export of readymade garment (million U.S. \$)	Export of Coir products (million U.S.\$)	Export of handicrafts (million U.S.\$)
1974 - 75	142	22	115
1975 - 76	265	24	137
1976 - 77	350	not available	212

This is an indication of the potentiality of huge rural employment. To promote this trade, the developed nations would have to create purchasing organisations in some of the developing countries, depending on the availability of such traditional skills. The international agencies can undertake

a survey of such traditional items and identify areas where there are concentrations of such skilled artisans. In fact, in low technology items like readymade garments this has happened and many developing nations have been able to create good employment. Unfortunately this employment in readymade garments has been mostly in urban areas so far. Emphasis shall now have to be given so that they are produced from rural areas only.

There is an increasing trend in highly industrialized nations to use more and more furniture , fixtures and household goods made of bamboo, cane, timber, ivory etc. There are still thousands of artisans located in some concentrated areas, most of them living in below the poverty line and if the developed nations extend their purchasing policy to these peoples/nations, it will not only bring about a much better understanding between a developed and a developing nation but also will make a tremendous impact on rural industrialization.

**2.3.3. Essential oil from surplus agricultural residues/
other local produce:**

To give an example, a product called 'bran oil' is produced from paddy husk, the bulk of which at present is being burnt just to dispose of it. These oils are extensively used in the pharmaceutical industry.

III. EXISTING EXPERIENCE IN RESPECT OF RURAL PRODUCTION UNITS:

During the pre-independence period, India's economy was basically agriculture-based, characterized by a lack of productive employment opportunities arising from over-dependence on agriculture and a lack of other avenues of gainful employment. After independence, the government laid emphasis on developing rural areas with the main objective of improving the socio-economic conditions of rural masses by generating further employment opportunities.

The facilities offered by the national governments are viz. -

- establishment of small-scale service institutes to formulate policies and undertake integrated development of small-scale industries
- establishment of National Small Industries Corporation to aid, counsel, assist and promote the interest of small-scale industries by hiring out facilities, establishing training centres and marketing products
- establishment of Khadi and Village industries Commission, handloom development Corporation, All India Handicrafts Board, the Central Silk Board and Coir Board for organising production of Cottage Industries.

The results are quite encouraging.

Wherever there is plenty of agricultural produces available, a small industry producing rice, wheat and edible oil has developed. In fact, one can see the presence of these units throughout the length and breadth of the country. Lumber mills have been set up in the areas where plenty of wood is available at a reasonable cost, and where markets are available and transport is economic. Most of the rural requirement of washing soap is met by the products of the rural soap industries.

In the case of handloom and handicraft products, employment went down but because of government intervention they are now doing much better. A huge market for these traditional products has developed through the governmental promotional and regulating measures.

In introducing the various technologies, one has to ensure that the technology is the appropriate one. Some typical experiences, the author has come across while trying to revitalise the existing traditional rural industries scheme, are given below:

- a) A traditional village artisan was supplied with improved tools. Barring a few exceptions, this scheme was not successful. There were about 15 Carpenters in the area. They were using basic tools and were supplied with the improved ones according to the scheme so that they could improve the quality and quantity

of production. In doing so, the aspect of intensive training for adapting to the new tools, was not properly looked into. Perhaps it would have been better to train a younger man on new tools who could mentally accept the new system quickly and readily. The other difficulty of the scheme was that whenever one artisan was successful in producing a greater quantity than before, the area could no longer support 15 Carpenters - two or three were sufficient. If this introduction of improved technology is extended further, the artisan will be a worker in a rural workshop and in that case the employment will be even less than before. Thus this type of introduction of appropriate technology can hardly make a dent in reduction in unemployment in rural areas.

- b) The other scheme that was tried was to have rural workshops so that the artisan who had no workshop, could work in a factory provided by the government. The artisans, who were attracted to such workshops, were dependant on the local market. Out of the various workshops that were tried, very few have become successful and those successful sheds were the ones which were set up very

near the main market of the small town. The units, which survived, were village soap making units, carpentry units, blacksmiths and tailoring.

Rural industrial estates were started in India in 1960. The one that was established in Assam, a north-eastern state in India had a printing press, a carpentry shop, a powerloom unit and an unit manufacturing items required by the nearby tea industries. This was located near the main highway and railway station. This had ten factory sheds of about 30' x 60' size. Infrastructural facilities such as telephone, power, internal road link, water were made available. These sheds were rented to enterprising entrepreneurs at a very nominal rate of US \$ 8.0 per 100 square metres a month. A service workshop was also provided where the machines of this workshop could be serviced. It was quite successful so long as the local government took an active interest in the marketing of products and supply of raw materials. Because of lack of entrepreneurship, two entrepreneurs did not do well.

There has been a significant development in Korea mainly due to the preferential purchase policy of large industries and department stores of developed countries like Japan and the U.S.A. Perhaps China has also done well in rural industrial development but details are not available. There is awareness of rural industrial development in the Philippines and Malaysia. In Latin

America development of rural industries is not very significant. In Tanzania there have been efforts to decentralize industries. In most of these countries, due to lack of an appropriate pattern of incentives, the efforts have not shown the desired results.

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IV. GROUPING OF PRODUCTS:

If appropriate groups of products could be identified which could be taken up for manufacture in typical rural production units, there would be an in built flexibility in the sector and some service industries also could be established to cater to the needs of these groups of industries. It is with this idea in mind that an exercise has been made to group the various products as given below:

- a. Processed cereal with animal fodder and oil extraction unit,
- b. Rice mill with non-edible oil and soap industry,
- c. Mini-pulp and paper plant with processed cereal or a lumber mill,
- d. Furniture with lumber mill,
- e. Building materials, brick and tiles with furniture fabrication facilities,
- f. Clothing and ready made garments.
- g. Handicraft and traditional products.

A rural service workshop could be practically coupled with any of these manufacturing units.

V. ASSESSMENT OF PLANT SIZE AND INVESTMENT
REQUIREMENTS:

Considering a typical agrarian economy in rural areas of the developing countries and typical rural needs, the following technical options are suggested:

1. Mechanized lumber mill with furniture fabrication facilities.
2. Mini-rice, wheat and oil complex unit for lower per capita income group areas (Per capita income less than \$ 150).
3. Rice mill complex unit for higher per capita income group areas (Per capita income more than \$ 150).
4. Washing soap unit.
5. Brick and Tile manufacturing unit.
6. Printing press, exercise books and book binding unit.
7. Rural mobile workshop for lower per capita income group (per capita income less than \$ 150).
8. Rural service workshop for higher per capita income group areas (per capita income more than \$ 150).
9. Leather and leather products unit.

In the light of the groups of industries listed above, the broad investment requirements, types and cost

of machinery, raw material inputs, assessment of operating costs, employment potentiality are given below:

5.1. Technical option:

Mechanized lumber mill with furniture fabrication facilities.

In suggesting this option, it has been assumed that sufficient quantity of wood is available in the area within an economic distance from the mill site and that power is available on the doorstep of the industry.

5.1.1. Process description:

The debarked logs of wood are first sized to the nearest square or rectangular cross section, as the case may be, in a horizontal band saw machine. Slabs of wood of desired thickness are then sawn by adjusting the height of the cutting blade manually. These slabs may be sold, as such, depending on customer requirements or further sawn into various sizes as per market requirement in a vertical band saw machine.

5.1.2. Type of equipment to be installed:

Broadly, the following equipment is required -

- A main 35 H.P. drive motor with line shaft arrangement for transmission of power to the various machines.
- Horizontal band saw machine.
- Vertical band saw machine.

- A pull trolley on rails for feeding the logs to the machine.

- Saw tooth grinder.

5.1.3. Investment requirement:

a. Fixed capital:

Land (2. acres) - US \$ 700

Plant and machinery - US \$ 9500

Building and site development. - US \$ 2500

Preoperative expenses - US \$ 1500

Total fixed capital - US \$ 14200

b. Working capital - US \$ 15000

5.1.4. Capacity:

Logwood processing:

10 cubic metre per shift of

8 hours working.

5.1.5. Employment potentiality:

Staff - 3

Workmen - 12

Total - 15

5.1.6. Inputs requirement:

Item	Unit	Quantity required per annum.
a. Debarked Log Wood.	Cubic metre.	3300
b. Saw blades.	Nos.	(24 sets for horizontal machine (24 sets for vertical machine.
c. Grinding discs		
d. Nuts and Bolts.		
e. Beltings and jointing materials.		
f. Grease.		

5.1.7. Economic lifetime of equipment: 20 years.

5.1.8. Cost of production & profitability:

Basis: One cubic metre of finished product.

Cost component	Value US \$
1. Raw material (assuming 30 per cent waste and price of logwood as \$ 81.00 per cubic metre)	115.70
2. Spares, consumables and power.	2.50
3. Salaries and wages.	3.80
4. Interest on working capital @ 12.0 per cent.	0.55
Sub Total A	122.55
5. Administrative overheads and contingencies @ 10.0 per cent of A.	12.30
6. Interest and depreciation @ 20% of fixed capital.	0.90
7. Cost of sales.	135.75
8. Selling price ex-factory.	140.00
9. Gross profit.	4.25

5.1.9. Gross return on investment : 98.8 per cent

5.1.10. Minimum sales requirements:

Breakeven will be at 60 per cent capacity utilisation on eight-hour-per-day working basis without taking into consideration any sales realisation on waste. In a rural economy the saw mill waste has some value for fuel.

5.1.11. Utilisation of waste:

The waste produced, depending on the species of wood used, could be utilised for making a mini pulp/paper unit. This has a good heating value and as such is used as domestic fuel.

The slicing may be used for fabrication of wooden furniture.

5.2. Technical Options:

Mini rice, wheat and oil complex unit for lower per capita income group areas (per capita income less than \$ 150)

This technical option has been suggested taking into consideration the following assumptions: power is available on the doorstep of the industry and sufficient paddy, wheat and similar grains, and seed are available in the area.

5.2.1. Process description:

The agricultural inputs, as received from the fields, are first manually screened to remove foreign materials. Paddy is charged into the Sheller unit where most of the husk is removed. The product from this unit is next manually screened to remove paddy from rice. The rice is next polished in a rubberlined huller unit. The finished product is rice and the dusty leftover can be used as animal fodder.

For production of flour and similar, cereals, the unground cereal is charged into the grinder, the product is screened to remove the ground cereal from the dust. The dusty byproduct can be used as animal fodder.

Oil is produced by squeezing the oil-bearing seed in a screw press. The seed is passed through the screw press number of times before the extraction is complete. The cake, produced

as a by product, can be used as animal fodder and manure.

5.2.2. Type of equipments:

Broadly the following equipment is required:

- A main 25 H.P. drive motor with line shaft arrangement for transmission of power to the various machines.
- Paddy sheller
- Rice huller
- Wheat/cereal grinder
- Oil extraction screw press
- Sieves

5.2.3. Investment requirements:-

a. Fixed capital:

Land (1.0 acre)	- \$ 350
Plant and Machinery	- \$ 8600
Buildings and site development	- \$ 1500
Preoperative expenses.	- \$ 1500
Total Fixed capital	- \$ 11950

b. Working capital - \$ 6000

5.2.4. Capacity:

Paddy processing	-- 2000 Kg.	Per shift of 8 hours working.
oil bearing seed processing.	- 600 Kg.	
Wheat/Cereal processing.	- 1000 Kg.	

Yield of rice is about 63 per cent on paddy, yield of mustard oil on seed is approximately 34 per cent and yield of flour/ground cereal on wheat/cereal is about 85 per cent.

5.2.5. Employment potentiality:

Staff	-	1
Workmen	-	10
Total	-	11

5.2.6. Input requirements:

Input item	Unit	Quantity requirement per annum.
a. Paddy	MT	660
b. Wheat/Cereal	MT	198
c. Mustard Seed	MT	330
d. Bearings		
e. Beltings and jointing materials.		
f. Grease.		

5.2.7. Economic lifetime of equipment: 15 years.

5.2.8. Cost of production and profitability:

Basis: 1260 Kg. rice
850 Kg. flour.
204 Kg. Oil.

Cost item	Value US \$
1. Raw material (assuming 63 per cent yield of rice on paddy, 85 per cent yield of flour on wheat and 34 per cent yield of oil on seed and price of paddy, wheat and oil seed as \$ 125, \$ 125 and \$ 315 respectively)	- 564.00

2. Spares, consumables and power.	-	6.50
3. Salaries and wages	-	27.00
4. Interest on working capital @ 12.0 per cent.	-	2.25
Sub Total A.	-	599.75
5. Administrative overhead and contingencies @ 5.0 per cent of A.	-	30.00
6. Interest and depreciation @ 20.0 per cent of fixed capital.	-	7.25
7. Cost of sales	-	637.00
8. Selling price (assuming price of rice, flour and oil as \$ 240, \$ 190 and \$ 900 respectively.)	-	647.50
9. Gross profit.	-	10.50

5.2.9. Gross return on investment:
29.0 per cent.

5.2.10. Minimum sales requirements:

Breakeven point will be at 75 per cent capacity utilisation with eight hours work per day. With higher hours of work the economic return will be higher.

5.3. Technical Option :

Rice mill complex unit for higher per capita income group areas (per capita income more than \$ 150)

5.3.1. Process descriptions:

Paddy is first loaded on the bucket elevators, which carries it to the vibratory screen. When the foreign materials and husk, have been removed, the paddy is fed to the sheller machine. The product from the sheller machine is screened on a multideck vibratory screen - the material which has escaped the action of machine is fed back to the machine and the raw unpolished rice is fed into a rubber-lined huller machine. The polished rice, along with dust and broken pieces of rice is then screened on an open vibratory screen to remove the various fraction and rice is bagged and marketed.

5.3.2. Type of equipment to be installed:

Broadly the following equipment is required.

- A main 50 H.P. drive motor with line shaft arrangement for transmission of power to the different sections .
- Bucket elevators
- Single deck vibratory screens
- Multideck vibratory screen
- High speed disc sheller
- Rubberlined huller.

5.3.3. Investment requirements:-

a. Fixed capital:

Land (1.0 acre)	-	US \$ 250
Plant and Machinery	-	US \$24000
Building and site development.	-	US \$ 4800
Pre-operative expenses	-	US \$ 2000
Total fixed capital	-	US \$31150

b. Working capital - US \$ 7500

5.3.4. Capacity:

Paddy processing - 10 MT per shift
of 8 hours working.

Yield of rice from paddy is
about 62 per cent.

5.3.5. Employment potentiality:

Staff	-	2
Workmen	-	6
Total	-	8

5.3.6. Inputs requirements:

Input item.	Unit	Requirement per annum.
a. Paddy	MT	3300
b. Beltings and jointing materials		
c. Bearings		
d. Grease		
e. Nuts and bolts.		

5.3.7. Economic lifetime of equipments: 15 years.

5.3.8. Cost of production and profitability:

Basis : 1000 Kg. rice.

Cost component		Value US \$
1. Raw material (assuming 62 per cent yield and price of paddy as \$ 125 per MT of paddy)	-	201.60
2. Spares, consumables and power	-	3.00
3. Salaries and wages	-	3.50
4. Interest on working capital @ 12.0 per cent	-	0.45
Sub total A	-	208.55
5. Administrative overheads and contingencies @ 10.0 per cent of A.	-	20.90
6. Interest and depreciation @ 20.0 per cent of fixed capital	-	3.05
7. Cost of sales	-	232.50
8. Selling price	-	240.00
9. Gross profit	-	7.50

5.3.9. Gross return on investment - 49.3 per cent

5.3.10. Minimum sales requirements:

Breakeven point will be at 50 per cent capacity utilisation on eight hours per day working basis without taking into consideration any sales realisation on waste. The waste is used as animal fodder.

5.3.11. Utilisation of wastes:

The husk can be used for extraction of

oil, manufacture of building brick and
cement, production of activated carbon.

The dust containing broken rice
particles in admixture with sliced maize,
mineral salts and vitamins can be used as
animal fodder.

5.4. Technical options: Washing soap unit.

In suggesting this option, it has been assumed all the inputs, as given later, are available at an economical price.

5.4.1. Process descriptions:

Linseed oil, castor oil and animal fat is mixed in appropriate proportion and heated with some amount of caustic soda in open pans indirectly heated by firewood. Gradually more and more caustic soda is added till saponification is complete. The material is then cooled and the precipitated saponified product is transferred to another pan. The necessary amount of sodium silicate, foaming agent and perfume is added and the mixture is kneaded to uniform composition. The semi-solid paste thus produced is placed on a die and hammered with a cupped hammer to a 500 gm ball, wrapped in bags and marketed.

5.4.2. Type of equipment to be installed:

Broadly, the following equipments are required:

- Pans
- Laddles
- Small handling implements

5.4.3. Investment requirement:

a. Fixed capitals:

Land (1.0 acre)	-	\$ 350
Plant & Machinery	-	\$ 950
Building and site development	-	\$ 650
Pre-operative expenses	-	\$ 500
Total fixed capital	-	\$ 2450

b. Working capital - \$ 9000

5.4.4. Capacity: 2000 balls of 500 grams each, per shift, working 8 hours.

5.4.5. Employment potentiality:

Staff	-	1
Workmen	-	8
Total	-	9

5.4.6. Input requirements:

Input item	Unit	Requirement per annum.
a. Linseed oil	MT	11
b. Animal fat	MT	66
c. Castor oil	MT	33
d. Sodium silicate	MT	157
e. Caustic soda	MT	26
f. Foaming agent		
g. Perfume		

5.4.7. Economic lifetime of equipment : 7 years.

5.5. Technical options:

Brick and tile manufacturing unit.

In offering this technical option, it has been assumed that the quality of soil required for making brick is available in the locality.

5.5.1. Process description:

The soil is mixed with the requisite quantity of sand to form a thick slurry, which is then cast on moulds and sun dried. The sun-dried bricks are then taken out of the mould and stacked in an open circular furnace. Firing is started from one end and is continued throughout till the batch is complete. The bricks are then allowed to be cooled, taken out of the furnace and marketed.

5.5.2. Type of equipment to be installed:

Broadly, the following equipment is required:

- Mud Mixers
- Mould

5.5.3. Investment requirements:

a. Fixed capital :

Land (25 acres)		US \$ 8750
Plant & Machinery	-	US \$ 1500
Building and site development.	-	US \$ 2000
Pre-operative expenses	-	US \$ 500
Total fixed capital	-	US \$ 12750

b. Working capital - US \$ 7500

5.5.4. Capacity : 1 million bricks per annum

5.5.5. Employment potentiality:

Staff	-	1
Workmen	-	50
Total	-	51

5.5.6. Input requirements:

Sand and clay being available at the plant site, we require only coal to be brought in. The requirement of coal is estimated at 300 tonnes per annum.

5.5.7. Economic lifetime of plant :

The plant will be worked till the quality of soil in the area is exhausted.

5.5.8. Cost of production and profitability:

Basis : 1000 numbers of bricks.

Cost component.		Value US \$
1. Raw material		0.80
2. Coal (0.20 MT per 1000 bricks)		4.00
3. Salaries & wages	-	13.00
4. Interest on working capital @ 12.0 per cent	-	0.90
Sub total A	-	18.70
5. Administrative overheads and contingencies @ 5.0 per cent of A	-	0.95
6. Interest and depreciation @ 20.0 per cent on fixed capital	-	2.55

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7. Cost of sales	-	22.20
8. Selling price ex-factory	-	25.00
9. Gross profit	-	2.80
5.5.9. Gross return on investment	:	22.0 per cent.
5.5.10. Minimum sales requirement	:	

Breakeven point will be at 90 per cent capacity utilisation with only five months working. If working period per year could be increased, depending on climatic conditions of the country, economic return will be better.

5.6. Technical option :

Printing press, exercise books and book binding unit.

This is recommended for an area having a literacy of around 20 per cent and per capita income high enough to sustain a printing press.

5.6.1. Type of equipment to be installed:

The following major equipment is required:-

- Printing press
- Drive motor of 2 H.P.
- Guillotine machine
- Binding machine

5.6.2. Investment requirements:

a. Fixed capital

Land (0.5 acres)	-	\$ 400
Plant and machinery	-	\$ 20000
Buildings	-	\$ 2500
Pre-operative expenses	-	\$ 1600
Total fixed capital	-	\$ 24500

b. Working capital - \$ 10000

5.6.3. Employment potentiality :

Staff	-	2
Workmen	-	12
Total	-	14

5.7. Technical options:

Rural mobile workshop for lower per capita income group (per capita income less than \$ 150)

This option has been suggested for an area where the per capita income is low and where mechanization has just started of late in a modest way. It will render service facilities such as repairs and maintenance of various agricultural implements, production of small garden tools, nuts and bolts etc. The scheme suggested is for an area of 10 Kms x 10 Kms. taking into consideration that power is available at the doorstep of the workshop.

This has been further subdivided into two - the first with agro-service facilities rendered on an hire-out basis and - the second, without agro-services facilities.

5.7.1. Scope of facilities offered:

With agro services facilities	Without agro services facilities
- Hiring out facilities of agricultural implements such as power tillers, pumps, harrows, etc.	- render services facilities at the interior rural area
- render service facilities at the interior rural area.	- meeting the immediate requirement for hardware such as nuts and bolts, garden tools, small ploughs, etc.
- meeting the immediate requirement for hardware such as nuts and bolts, garden tools, small ploughs, etc.	

- rural transportation facilities

5.7.2. Type of equipment to be installed:

Broadly, the following equipments are suggested:

With agro-service facilities.	Without agro-service facilities.
- 20 nos. of power tillers 10 B.H.P.	- one no. power tiller 10 B.H.P.
- 20 nos. centrifugal pumps with diesel engine set 20 B.H.P.	- one no. bicycle
- A small lathe machine	- A small lathe machine.
- Arc welding and gas welding set.	- Arc welding and gas welding set.
- Drilling machine	- Drilling machine.
- Bench grinder	- Bench grinder.
- Blacksmithy shop	- Blacksmithy shop
- Carpentry shop	- Carpentry shop
- Garage tools	- Garage tools.
- Tools and tackles.	- Tools and tackles

5.7.3. Investment requirements:

	With agro-service facilities.	Without agro-service facilities.
Land	\$ 700	\$ 350
Plant & machinery	\$ 4000	\$ 8000
Building and site development.	\$ 2000	\$ 1000
Pre-operative expenses	\$ 2000	\$ 1500
Total capital expenditure.	\$ 68700	\$ 10850

5.7.4. Employment Potentiality:

	With agro service facilities.	Without agro service facilities.
Staff	3	1
Workmen	9	7
Skilled	9	7
Semiskilled	33	2
Unskilled	7	8
Total	52	18

5.7.5. Inputs requirements:

Input requirements will be more or less the same except that the requirements for spares for power tillers and pumps for the one with agro service facilities will be higher. The major inputs will be

- Diesel oil, mobile, grease etc.
- Steel materials such as flats, rounds and rods.
- Electrodes.
- Oxygen and acetylene gas
- Timber
- Spares for agricultural implements
- Consumables such as cotton waste, grinding discs etc.

5.7.6. Economic lifetime of equipment : 10 years.

5.7.7. Cost of servicing, fabrication and hire out facilities and profitability:

Basis : One year operation

The cost of materials of fabrication, spares and consumables will be charged extra at cost plus 5 per cent.

Cost component	Value US \$	
	With agro-service hire out facilities.	Without agro-service hire out facilities.
1. Power and fuel	15800	2900
2. Spares for implements	2500	200
3. Salaries and wages.	40200	14600
4. Interest on working capital @ 12.0 per cent.	720	480
Sub total A.	58500	18180
5. Administrative overheads and contingencies @ 5.0 per cent on A.	2930	910
6. Interest and depreciation @ 20.0 per cent on fixed capital.	13740	2170
7. Cost of servicing, fabrication, hire out facilities.	75170	21260
8. Gross sales realisation on the basis of working hours and machine running charges per hour as given below: (Annexure - I.)	100905	27405
9. Gross profit.	25735	6145

5.7.8. Gross return on investment: 37.5 per cent 56.6 per cent

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ANNEXURE - I.

Gross sales realisation

Section	Yearly running hours.		Rate of servicing, fabrication & hire out facilities. US \$/hr.	Sales value US \$	
	With agro service facilities hrs.	Without agro service facilities hrs.		With agro service facilities.	Without agro service facilities
Power tillers	1500x20	1000	1.50	45000	1500
Pumps	1500x20	-	1.00	30000	-
Blacksmithy	1650	1650	1.00	1650	1650
Machine Shop	1980	1980	10.00	19800	19800
Carpentry	1980	1980	1.50	2970	2970
Automobile	990	990	1.50	1485	1485
Total:				100905	27405

5.8. Technical option :

Rural service workshop for higher per capita income areas (per capita income more than \$150)

This option is suggested for a higher per capita income area and where the general inclination of people is towards mechanization. In addition to providing the service facilities for semi-industrialized rural areas, it will have a production unit to meet various rural needs. The surplus production will be diverted to the urban areas. It will also have automobile servicing facilities. The scheme suggested is for an area of 50 Kms x 50 Kms, taking into consideration that power is available on the doorstep of the workshop and there exist a reasonable number of tractors, power tillers, agricultural pumps and small industries.

5.8.1. Scope of facilities offered:

- Repair, maintenance and major overhauling facilities for agricultural implements like tractors, power tillers, pumps, diesel generation set, machineries for rice mill, oil mill, lumber mill etc.
- Automobile servicing facilities
- Production of typical rural needs like small agricultural implements, hardware, fixtures, furniture, small tankages,

building materials etc.

5.8.2. Type of equipment to be installed:

RURAL SERVICE WORKSHOP

Garage	Machine Shop	Production Shop	Carpentry Shop
- Compressor	- Lathe	- Gas & arc welding set.	Wood lathe
- Vulcanizing Unit.	- Shaping machine.	- Blacksmithy shop	Carpentry hand tools.
-	- Milling machine.		
- Breakdown and repair tools.	- Drilling machine.		
	- Grinding machine		
- Servicing equipment.	- Shearing machine		
	- Power hack saw.		

5.8.3. Investment requirements

a. Fixed capital

Land (1.5. acres)	\$ 600
Plant & Machinery	\$ 31000
Building and site development	\$ 4000
Pre-operative expenses	\$ 3000
Total fixed capital	\$ 38600

b. Working capital \$ 25000

5.8.4. Employment potentiality:

Staff	-	5
Workmen	-	
Skilled		20
Semiskilled		10
Unskilled		27
Total	-	62

5.8.5. Input requirements :

- Spares for automobiles, tractors, power tillers, pumps, various small industries like rice mill, oil mill, lumber mill etc.
- Steel materials like M.S. plates, flats, rounds
- Timber
- Diesel oil, mobil oil, grease
- Consumables like gaskets, waste cotton, hack saw blades, files etc.

5.8.6. Economic life of equipment : 15 years.

5.8.7. Cost of servicing and fabrication and profitability:

Basis : One year operation.

The cost of materials for fabrication, spares and consumables will be charged extra at cost plus 5 per cent.

Cost component	Value US \$
1. Power -	4500
2. Salaries and wages -	72300
3. Interest on working capital @ 12.0 per cent -	3000
Sub total A -	79800
4. Administrative overheads and contingencies @ 5.0 per cent of A -	3990
5. Interest and depreciation @ 20.0 per cent on fixed capital -	7720

- 6. Cost of servicing and fabrication - 91510
- 7. Gross sales realisation on the basis of working hours and machine running charge per hour as given below: - 117480

Section	Yearly running hours. hrs.	Rate of servicing & fabrication \$/hr.	Sales value \$
Garage	2310	4.00	9240
Blacksmithy	1050	2.00	3300
Machine shop	1980	35.00	69300
Carpentry	1980	3.00	5940
Fabrication	1980	15.00	29700

8. Gross profit - 25970

5.8.8. Gross return on investment : 67.3 per cent.

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VI. ADOPTION AND DIFFUSION OF APPROPRIATE TECHNOLOGY:

6.1. For the successful adoption of the technical option 'Mechanized lumber mill with furniture fabrication facilities', it has to be ensured that sufficient logwood is available in the area at an economic cost at the mill site throughout the economic lifetime of equipment and that there is a ready market for the product in the area or that the product can be marketed in other areas at an economically acceptable price. It is normally observed that the mill owners take leases out on forests in the area and in this way they are assured of a constant supply of the most vital input or else, at times, it is seen that the mill activities remain idle for want of raw materials. The capacity indicated is based on eight hours of work per day. With more hours of work, capacity utilization will be better, resulting in much improved financial returns.

It is possible to train any rural person within two to three months to operate the unit. Training should precede installation of equipment so that the same person can be utilised during installation to let them know the machinery more intimately.

Adequate safety arrangements are to be made near the horizontal and vertical band saw machine.

There are reports of fatal accidents because of either negligence on the part of the operator or inadequate safety arrangements.

- 6.2. The technical option 'Mini rice, wheat and oil complex unit' is intended for an area having low per capita income. The capacity indicated is on the basis of eight hours of work per day. With more hours of work, capacity utilisation will be better, resulting in much improved financial returns. As the agricultural produce is of a seasonal nature, investment will remain idle for a number of days in a year. Alternate arrangements for employment of these workers has to be found.

The industry is quite a profitable one in a free rural economy.

It is possible to train any rural person within three to four months to operate this unit.

- 6.3. The technical option 'Rice mill complex Unit' is intended for an agricultural area where per capita income is high or where the quantity of agricultural produce is so high that small units cannot cope with the input. The capacity indicated is on the basis of eight hours of working per day. With more hours of work, the capacity utilisation will be better.

The industry is quite a profitable one in a free rural economy.

It is possible to train any rural person within four to six months to operate the Unit. This option can be coupled with an oil extraction unit, cereal grinding unit or an animal fodder manufacturing unit in the course of time.

- 6.4. The technical option 'soap manufacturing Unit' is recommended for an area where there is a ready market for this product and where all the raw materials can be procured at an economically accepted price from elsewhere. The capacity indicated is on the basis of eight hours work per day and with more hours of work, profitability will be better.

It is possible to train any rural person within four to six months to produce such products.

This unit can be coupled with an essential oil or non-edible oil producing unit.

- 6.5. The technical option 'brick and tile manufacturing unit' is for an area, where the particular type of soil required for brick manufacturing is plentifully available. The consumption of the product will mostly be in semi-urban or urban areas. This is a seasonal industry in the sense that during rainy season the operation cannot be continued. The capacity indicated is on the basis of round-the-clock operation for five to six months. One disadvantage

that has to be borne in mind while setting up a brick manufacturing unit is that the land becomes barren after the operation is complete.

It is possible to train rural persons within eight months to one year to produce quality products.

- 6.6. The technical option 'printing press, exercise books, book binding unit' is intended for an area where a minimum of 20 per cent of the population are literate. In setting up these units, the national government has to ensure that not more than the requisite number of units could be established in the area.

The rural high school dropouts with one year of training should be able to compose the content and operate the printing press.

- 6.7. The technical option 'rural mobile workshop' has been suggested for an area with a low per capita income. An information system should be developed.

The rural matriculates with two years of training should be able to attend to the various repairs and maintenance jobs.

- 6.8. The technical option 'rural service workshop' is intended for a higher per capita income area. The scheme offered is a general one and, as such, it will depend on the type of industrial environment around.

In general, the rural matriculates with two years of training should be able to meet the requirements for skilled manpower.

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VII. LINKAGES BETWEEN URBAN AND RURAL SECTORS:

The industrial economy in most of the developing countries is centred around urban areas. As such it would be very desirable that the products of the rural industries were used as the raw materials for the urban ones. There will then be a balanced development of industrial activities in the country resulting in generation of new economic activities in the rural areas.

Technical options offered in this paper have not taken into consideration any linkage between the rural industries and the urban ones because products and services of these industries are primarily meant for rural use; of course the economy of rural industries will definitely improve and many of these products will be able to cater for urban consumption as the rural industrial base improves.

Rural workshops, as offered in technical option 5.7 and 5.8 could undertake manufacture of raw materials and semi-processed goods for urban industries. This is illustrated by the following products: (Table I)

This is only an illustration of how a number of parts and components of any standard product of

TABLE -I.

**PRODUCTS OF URBAN
INDUSTRIES.**

**DIFFERENT COMPONENTS
WHICH COULD BE FABRI-
CATED BY THE RURAL
WORKSHOP.**

1. Centrifugal Pumps

Shafts
Keys
Grease Nipples
Machining of Castings.
Foundation Bolts.
Glands.

2. Small Lathe Machine

Foundation Bolts
Small penions without
heat treatment.
Gear levers.
Pulleys.
Bushings.

3. Automobiles

Gear levers
Grease guns
Hangers.
Fixtures.
Tierod ends.
Steering rings.

4. Small Electrical
Equipments like
motors, table
lamps.

Shaftings.
Keys.
Rails.
Electric Switch Boards.
Wooden fixtures.
Lamp stands.

renowned make can be sub-contracted for manufacture in rural industries. To enable the rural areas to make components for standard products of well-known makes, there will have to be a deliberate policy on the part of large urban industry or department stores to provide training, worksheds, drawings, specifications and transport facilities at the cost of the buyer. The extra expenditure so incurred can be made up by the buyer on account of lower wages and overhead costs in rural industries.

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VIII. POLICY INCENTIVES AND CONCESSIONS:

The rural industries, by their very nature, have to generally operate under following constraints, viz.

- lower levels of production
- lack of research and development facilities for product design and subsequent improvisation
- lack of market research and development facilities
- lack of adequate means of quality control
- limited availability of funds for working capital
- lack of adequate infrastructural facilities
- steady supply of various raw materials, chemicals and utilities.

Keeping in view these factors and the vital contribution of rural industries to the country's economy, the national governments of the developing countries should adopt such policies, both promotional and regulatory, so as to develop the rural industries along with the large sector urban industries.

8.1. Financial assistance:

Liberalized long-term loan at a concessional rate of interest should be available for a techno-economically viable project and no interest should be charged during the

gestation period. Most of the rural industries suffer for want of adequate working capital. Arrangement should, therefore, be made for adequate availability of working capital, at a concessional rate of interest. A moratorium on payment of interest should be allowed for a predetermined period depending on the nature of the industry.

8.2. Subsidy for backward area development:

There should be an outright subsidy at the rate of 15 per cent of capital investment for industries located in backward areas. Subsidy on transport of raw materials and finished products should also be available for areas which have definite locational disadvantage.

8.3. Entrepreneurial assistance:

Considering the need for intensive training programmes for rural industries to enable them to produce quality products, the national Government should establish centres for training of workers of all categories and this should be done at the cost of national government.

8.4. Sales assistance:

Rural cooperative sales organisations should be set up for marketing the products of groups of rural industries and for carrying out market surveys for existing products, and possible new products, which could be produced in rural areas.

8.5. Purchase assistance:

Rural industries many a times suffer for want of raw materials, chemicals and utilities. The setting up of government purchasing units would definitely help in removing these constraints. The rural industries would place their intent of materials requirement to the nearest Government purchase unit who would either procure directly or assist the rural industries to get the same.

8.6. Research and developmental assistance:

Research and development centres for rural industries should be set up in different areas. The centres would provide technical assistance to the industrialist or group of industrialists in product design or any other technical matters.

8.7. Power should be available on the doorstep of the industry and there should be no restriction on the sustained availability of power. The tariff rate of power should be at an economic rate to the rural industry.

8.8. There should be no control on supply of raw materials and services.

8.9. If no suitable entrepreneur(s) can be located, the national Government should come forward to the rural mobile workshop or rural service workshop as this is considered the nucleus for rural industrialization.

- 8.10. The commodities to be manufactured in rural areas, should be earmarked by the national government to avoid competition from urban industry.
- 8.11. The national government should determine the number of manufacturing units in respect of the manufacture of certain items in a particular locality and should ensure that no permission is given to others to avoid creating either a shortage in raw material or a glut in the demand. This, of course, has to be reviewed from time to time, as the demand and supply position changes.
- 8.12. There should be a rebate on excise duties, sales tax and other leviable taxes at least for the first few years of operation.
- 8.13. Wage policy:

If appropriate technology is intended for a rural industry, it is mainly to create employment and, as such, basically it has to be labour-intensive. To compensate for the disadvantage of location and labour-intensiveness the wage has to be lower than that of a similar urban worker. This is also necessary to avoid creating tension in the rural area.

8.14. **Infrastructural facilities:**

Adequate infrastructural facilities
e.g. for housing, schools, hospitals, drinking
water, transportation facilities, etc should
be provided by the national government.

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IX. GUIDELINES FOR STRATEGY DEVELOPMENT:

9.1. Cooperation among developing countries:

The developing countries should cooperate in respect of the following

- a. Earmarking manufacture of processed and semi-processed goods by the various developing countries.
- b. Relaxation in movement of materials from one country to another by better utilisation and development of land routes.
- c. Preferential tariffs on purchase of goods and equipment from developing countries,
- d. Technical and economic cooperation amongst the developing countries through bilateral and multilateral agreements for efficient utilisation of resources and for expeditious development of rural industry.
- e. International agencies to take up identification of resources of rural areas - material and human - and assess the requirement for appropriate technology in the area.

9.2. Entrepreneur manager for rural industries:

As has been mentioned earlier, there is a possibility of getting a band of new entrepreneur-cum-executive professionals in the industrialized nations, who are looking for a challenge in new surroundings and circumstances. An international agency like UNIDO should take the initiative

and responsibility to locate these entrepreneur-cum-executives and the developed nations should create a fund for their expenses and remuneration. These professionals should be earmarked for various rural industries in the developing countries.

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X. SUMMARY AND CONCLUSIONS:

The developing countries are characterized by a typical agrarian economy, the employment in agriculture being about 70 per cent. Therefore such a vast population can hardly be encouraged to become mobile for seeking employment in industrial nations or even to the urban areas of that country when we have to try to achieve a reverse in the ratio of agricultural to industrial employment from 70 : 30 to 30 : 70.

Apart from agricultural activities, therefore, some industrial activities can be created in these rural areas.

The principal needs of rural areas in terms of agricultural inputs and consumption goods are analyzed as under:

- a. Agricultural inputs such as agricultural implements, chemicals e.g. for fertilizers, insecticides, availability of power and water.
- b. Consumption goods such as processed cereals, clothing and ready-made garments, edible and non-edible oil, soap, building materials, animal fodder, brick and tiles, furnitures, leather and leather goods.

A scheme for utilisation of surplus resources and traditional skills is also given e.g. for a mini pulp and paper plant from agricultural residues, handicraft and traditional products by rural artisans, essential oil

from surplus agricultural residues or other local seeds.

The paper offers nine technical options for adoption in rural areas:

1. Mechanized lumber mill with furniture fabrication facilities.
2. Mini rice, wheat and oil complex unit for lower per capita income area.
3. Rice mill complex unit for higher per capita income area.
4. Washing soap unit.
5. Brick and tile manufacturing unit.
6. Printing press, exercise books and book binding unit.
7. Rural mobile workshop for a lower per capita income area.
8. Rural service workshop for a higher per capita income area.
9. Leather and leather products unit.

These technical options are analyzed from the following standpoints: assumption, process, description, type of equipment to be installed, investment requirement, capacity, employment potentiality, input requirements, economic lifetime of equipment, minimum sales requirements, cost of production and profitability and utilisation of waste from the process.

Experience in respect of operation of such units are also illustrated for some developing countries.

Depending on the availability of raw materials, traditional skill, per capita income, geographical location of the area, it is felt that one or more of the options should be techno-economically viable for adoption in developing countries.

Finally, keeping in view the various constraints faced by rural industries, certain policy incentives and concessions are suggested for adoption by the national government for rapid and steady growth of the rural industries.

- Financial assistance in terms of liberalized long-term loans at a concessional rate of interest for the capital cost of the project. Arrangements should also be made for availability of requisite working capital.
- Subsidy for backward area development
- Entrepreneurial assistance in terms of supply of trained rural force.
- Sales assistance by setting up rural cooperative sales organisations.
- Purchase assistance by setting up a government purchasing agency.
- Research and developmental assistance by setting up research and development centres for rural industries.
- Power should be available on the doorstep of the industry and at an economical rate of tariff.

- There should be no control on supply of raw materials and services.
- Running of rural mobile workshops for lower per capital income areas and rural service workshops for higher capita income areas.
- Earmarking of commodities to be manufactured by rural industries.
- Determining the no. of units manufacturing a particular commodity in area and ensuring that no licence is issued to any other entrepreneur.
- Rebate on excise duty, sales tax and other leviabale taxes for the first few years of operation.
- Rational wage policy.
- Supply of infrastructural facilities.

It is also suggested that the developing countries should cooperate in respect of followings:

- Earmarking the manufacture of processed and semi-processed goods by the various developing countries.
- Relaxation in movement of materials from one country to the other.
- Preferential tariffs on purchase of goods and equipment from developing countries.

- Technical and economic co-operation amongst the developing countries through bilateral and multilateral agreements.

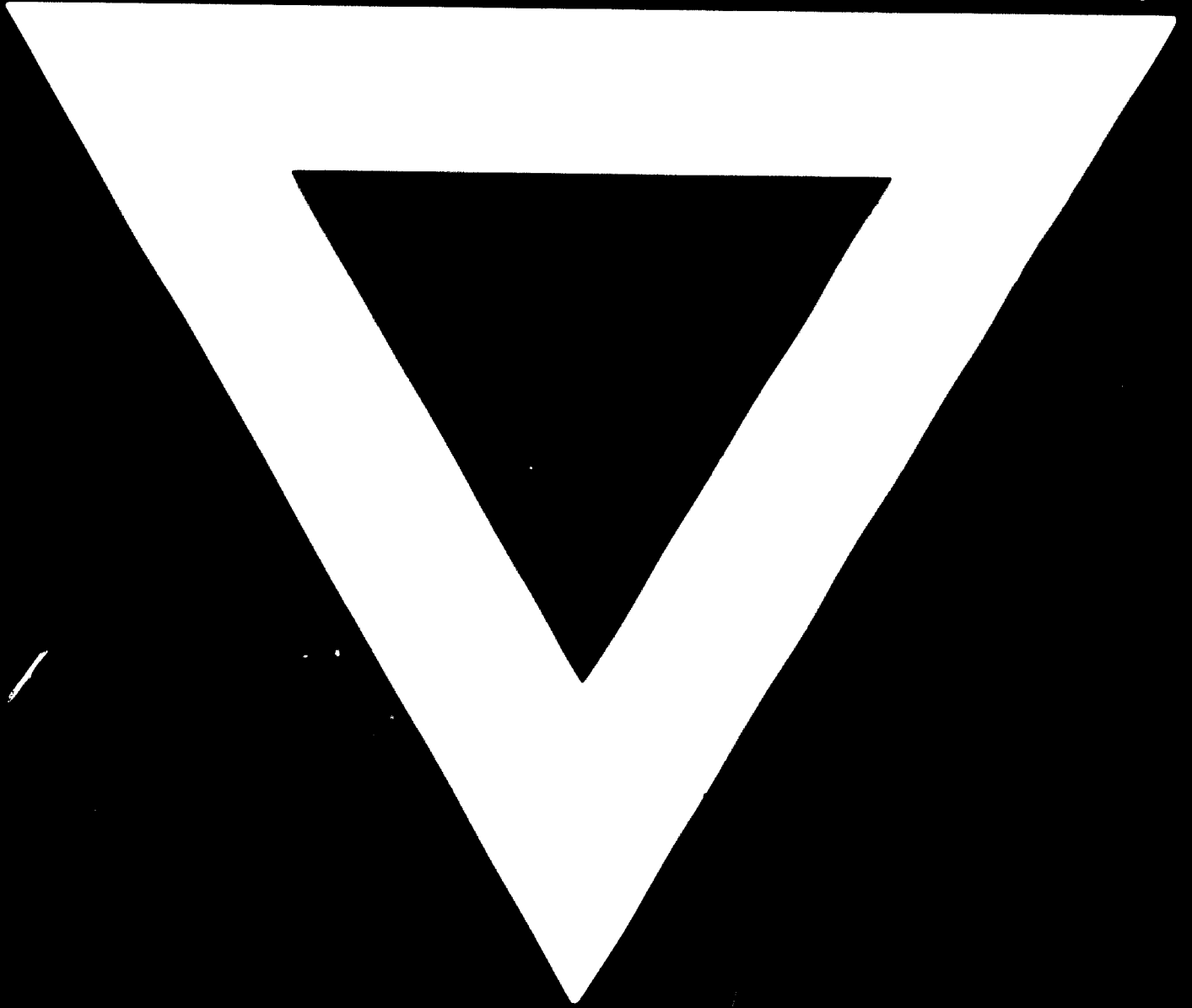
- International agencies should identify the raw material and human resources and accordingly suggest adoption of appropriate technology.

- International agencies should identify and make available expert personnel in particular small-scale branches of production from industrialized and other developing countries and create a fund to finance their remuneration and expenditure.

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